

**The 36th Annual Gun & Ammunition
Symposium
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**Air Bursting Munitions
A Systems Perspective**

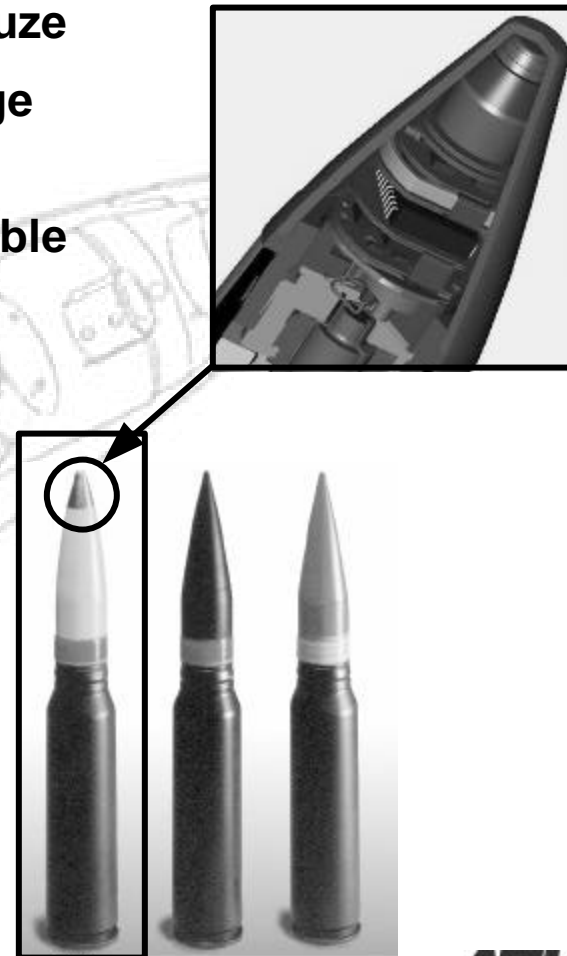
Overview

ABM

- **Bursting Munition with Turns Counting Fuze**
- **Initial carrier—existing 30mm HEI cartridge (PGU-13)**
- **Leverage OICW components where possible emphasize modularity and commonality**
- **Programmable for variable range bursts**



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ATK
ALLIANT TECHSYSTEMS

Overview



- Cooperation between the
 - Alliant Ammunition Systems Company (AASC)
 - Alliant Precision Fuze Company (APFC)
- Hardware oriented I.R.&D. program with an emphasis on round affordability
- Build on the OICW bursting round technology but move it to the next level with:
 - Implementation of a hybrid turns/time algorithm
 - Survivability at setback levels of 60k g's muzzle velocity of 1100 m/sec and spin rates of 2000 rps
 - Achieve commonality across future round sizes

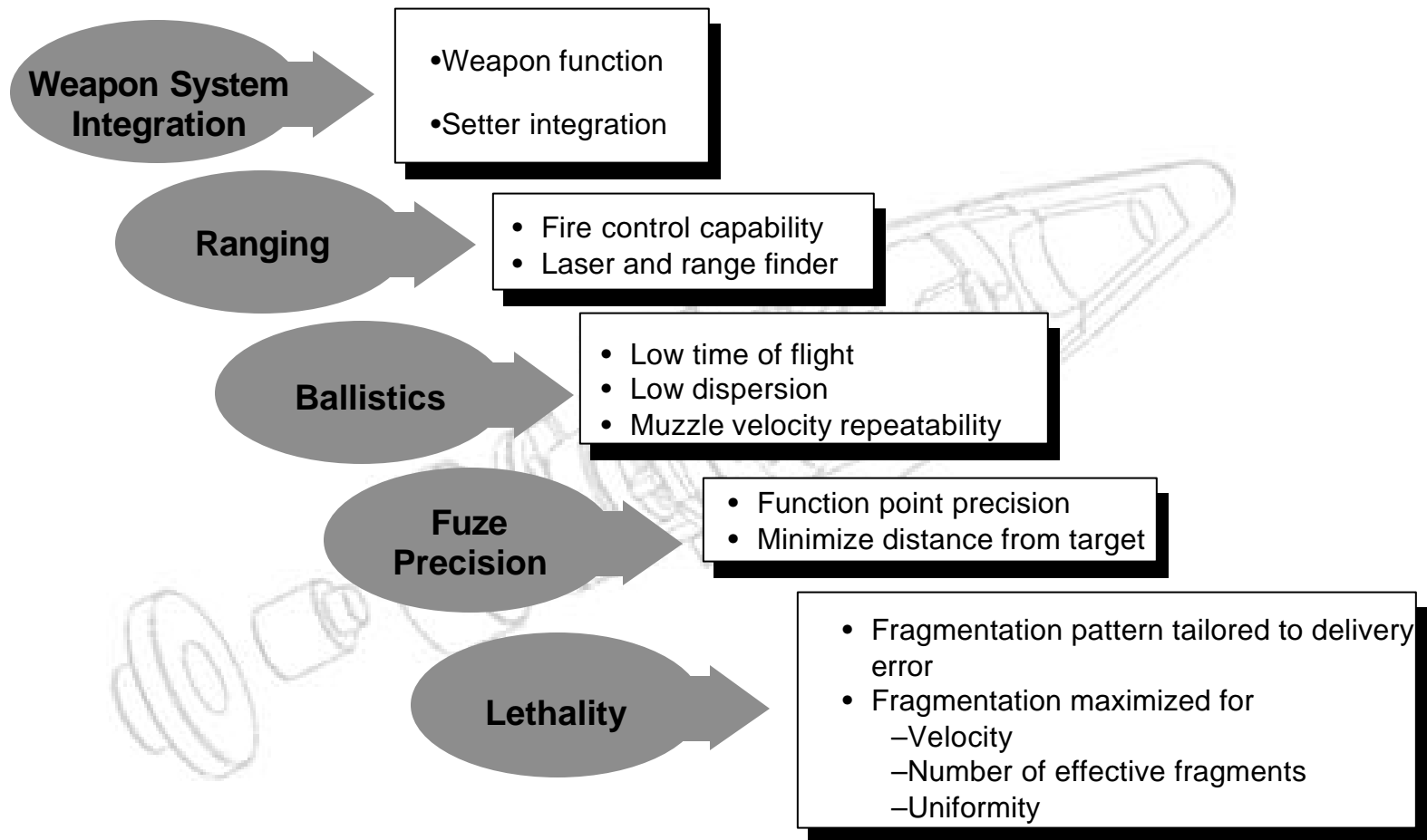
Overview



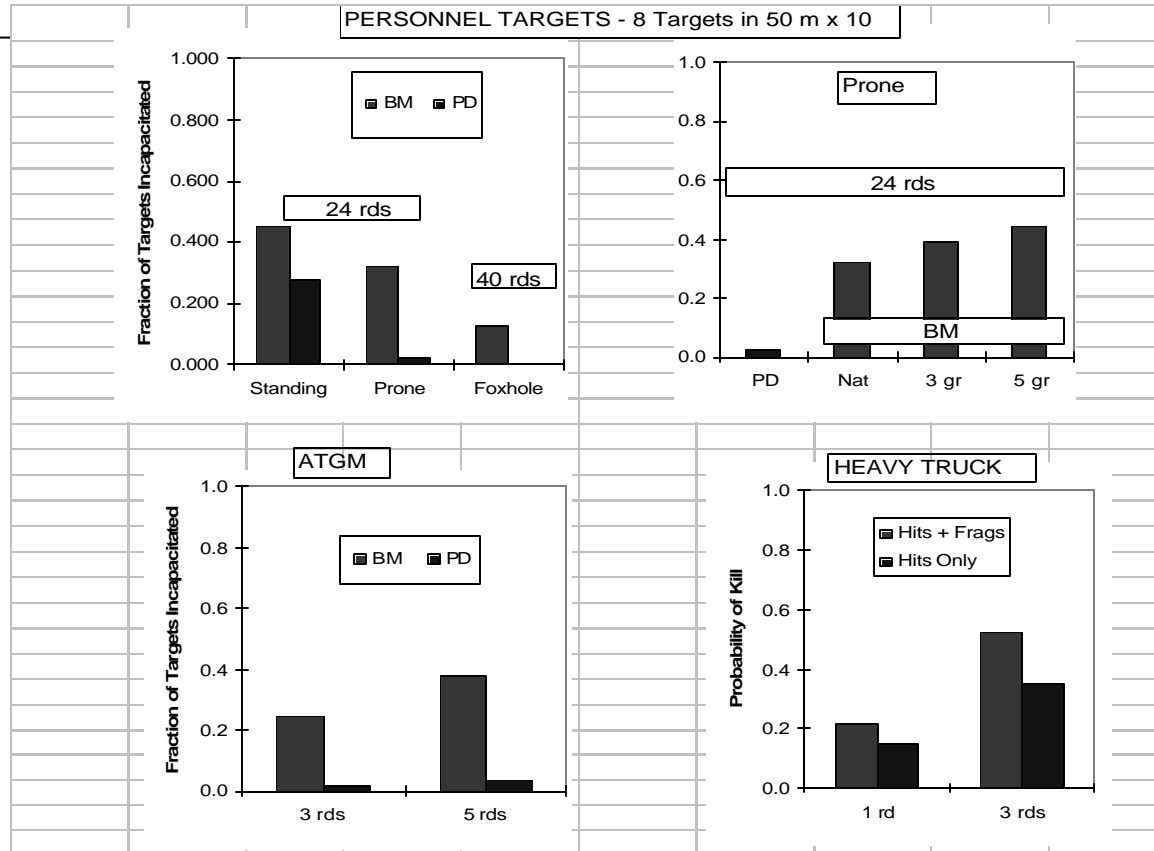
Multi-year Schedule

Precision Airburst Common Fuze Development Schedule										
	Q3 FY00	Q4 FY00	Q1 FY01	Q2 FY01	Q3 FY01	Q4 FY01	Q1 FY02	Q2 FY02	Q3 FY02	Q4 FY02
Kick-off Airburst IR&D										
Design Airburst Fuze										
Design EPS Fuze										
Softcatch Test Projectiles										
Data Recorder Tests										
Airburst Demonstration										
Lethality Optimization										
Alternate Power Sources										
Miniaturization										

Integration of Critical Capabilities Systems Approach



Effectiveness



BM = Bursting Munitions
PD = Point Detonator

Requirements



Air Bursting Munition Design Characteristics

Safe	<ul style="list-style-type: none">• Fully compliant with MIL-STD-1316• Command arm for MOUT applications• Self destruct capability
Lethal	<ul style="list-style-type: none">• Inductively programmable as round is chambered• Multi-function: precision airburst, delay after impact, and impact• Effective against target in defilade• Programmable modes: windows, string of pearls
Cost Effective	<ul style="list-style-type: none">• No barrel-mounted magnetic coils required• Modular design• Standard components• Commonality of key subsystem (i.e., S&A)

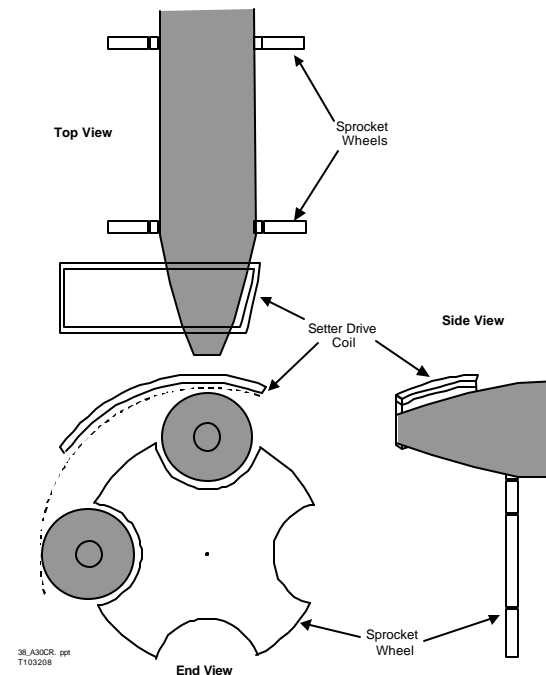
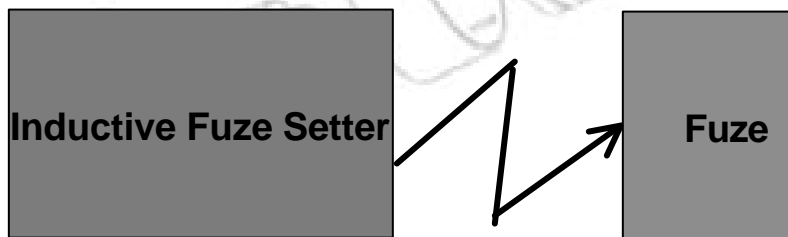
Setting

ABM

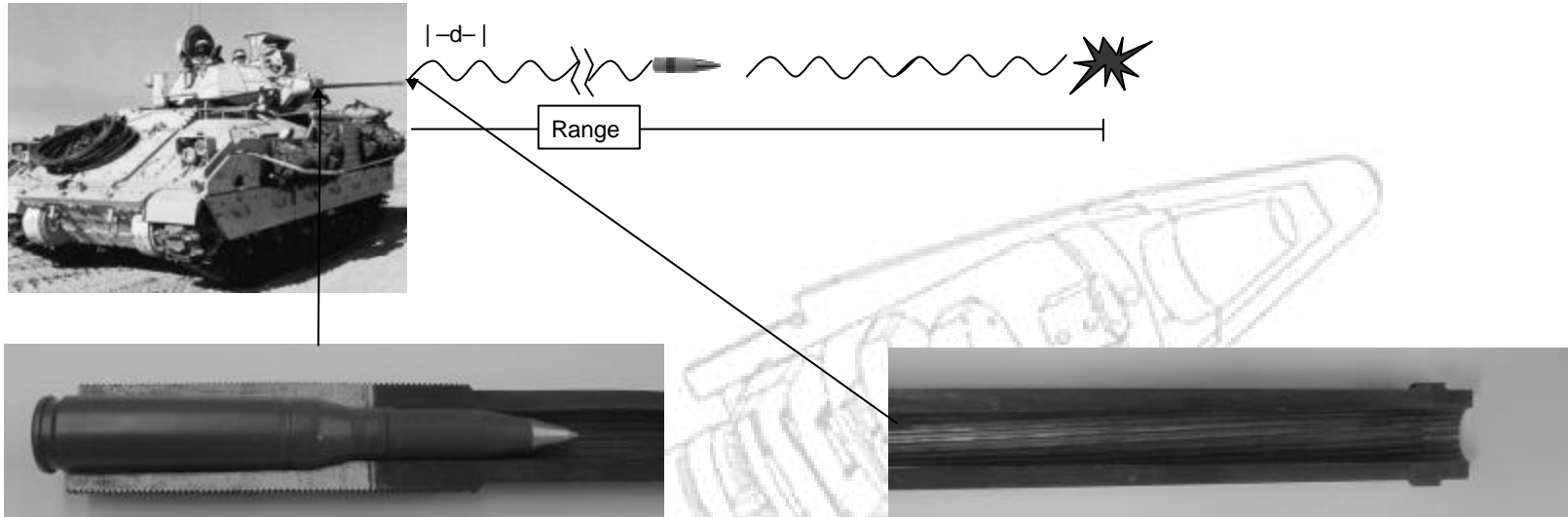
Inductive Link Setter Features:

Power the fuze during setting process

- Inductively transmit data to fuze
- Requires high power
- Bullet position can vary or can be moving through coil during transmission
- High data rate capable

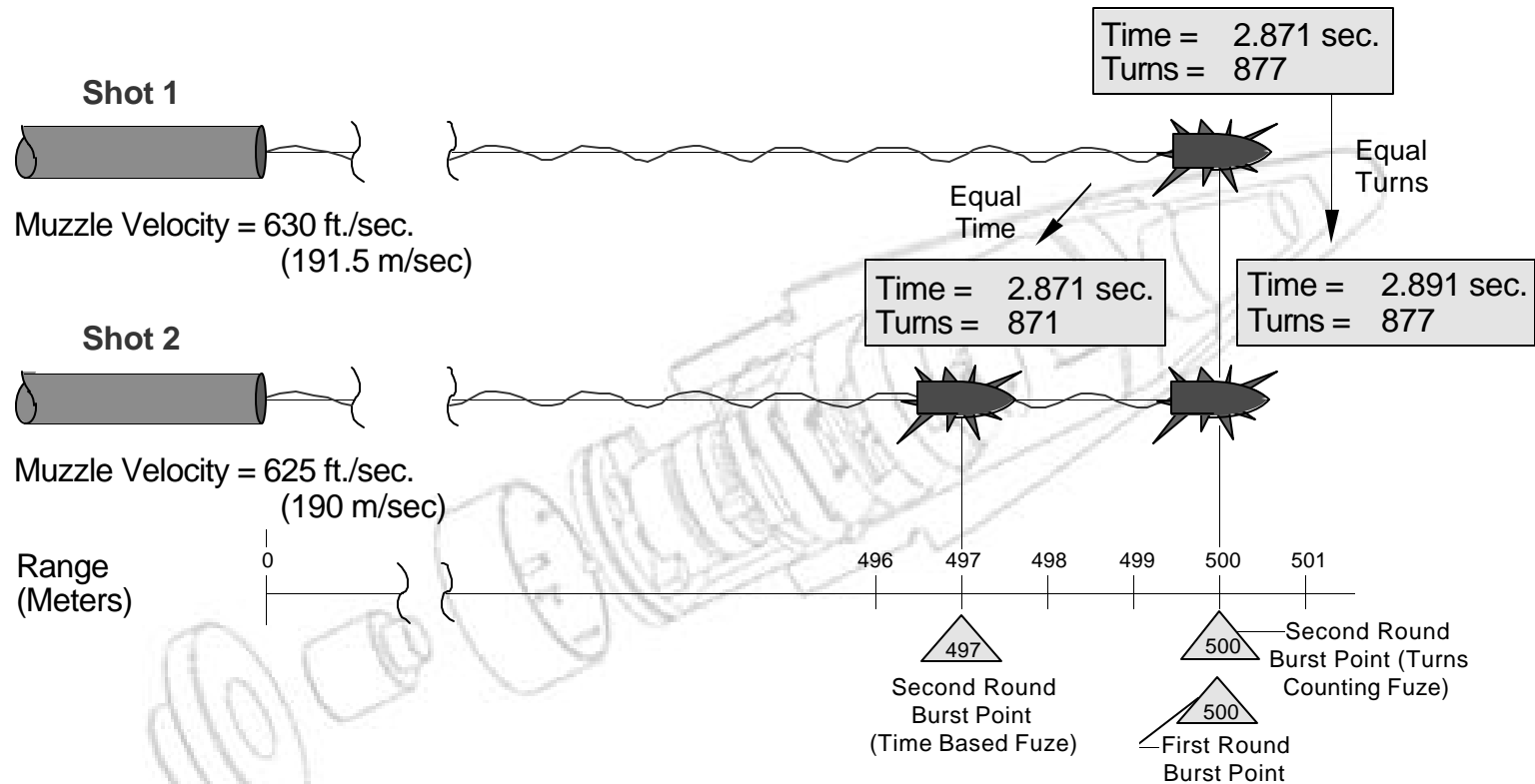


Turns Counting



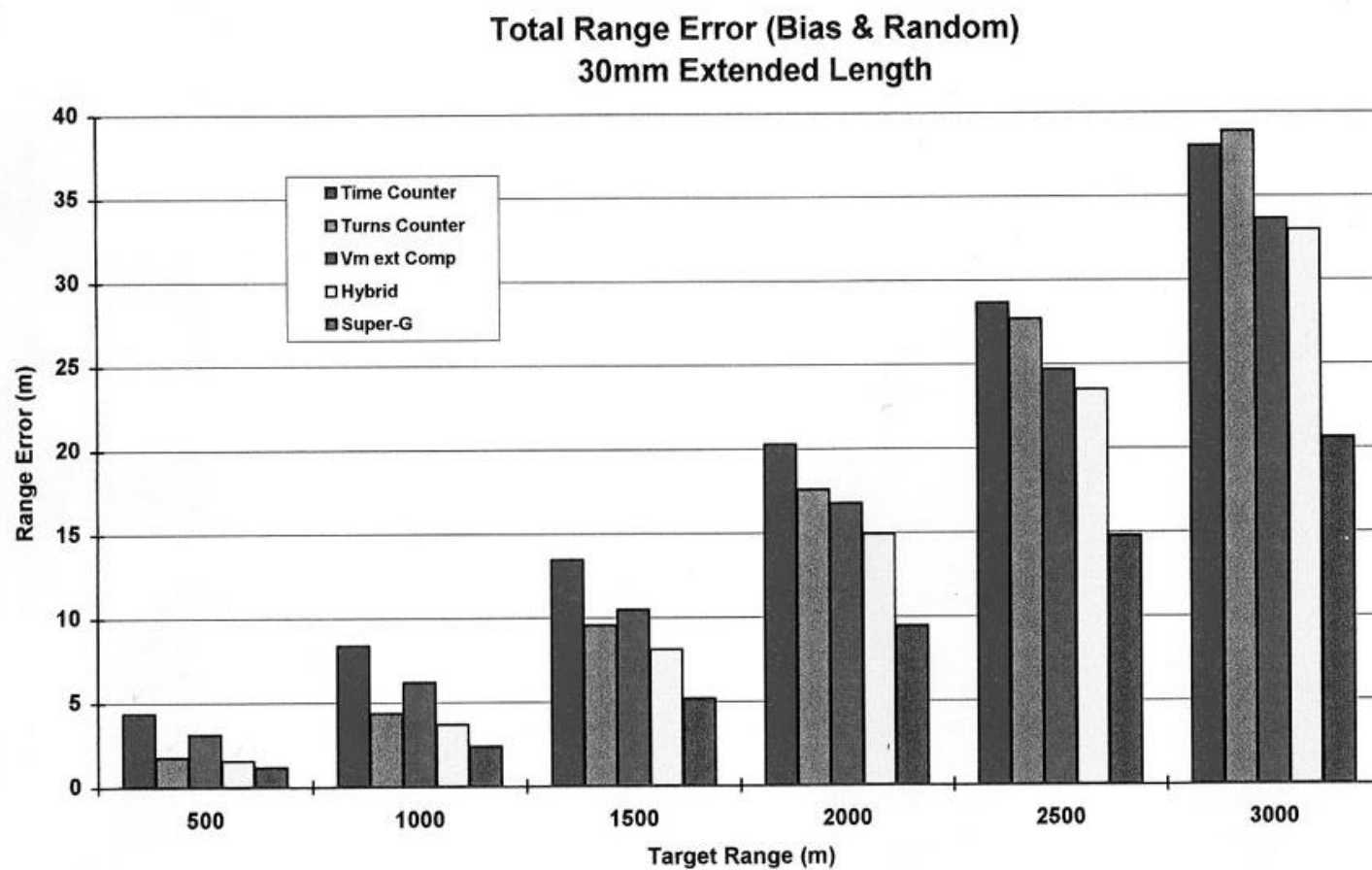
- Barrel twist relates spin rate to range independent of muzzle velocity
- As range increases the relationship between spin rate and distance degrades due to meteorological conditions and aeroballistic error coefficients

Comparative Approaches



- Airburst Fuze based on turns counting is less sensitive to muzzle velocity variations than a time based fuze

Comparative Approaches



30mm ABM Projectile Rounds



TP Aluminum



Titanium



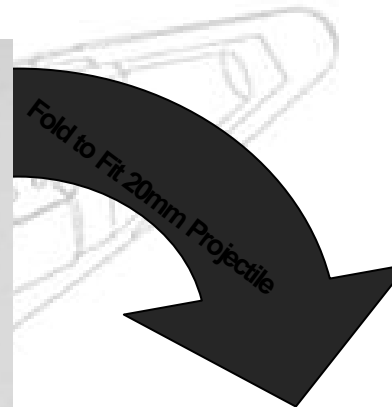
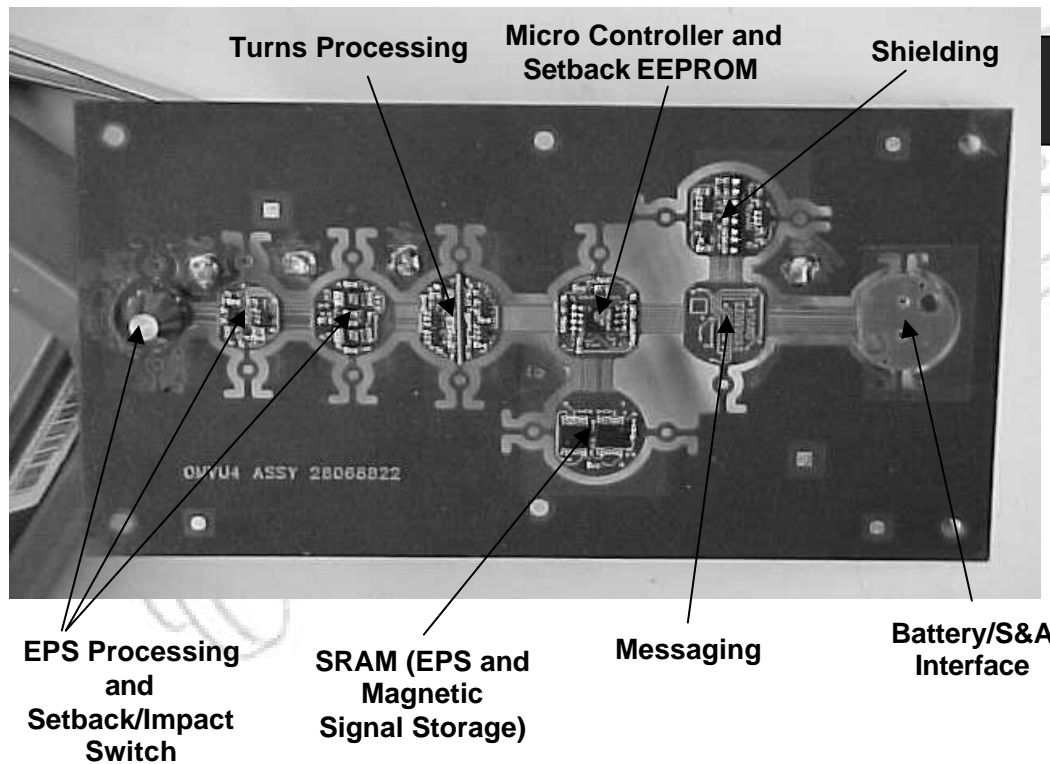
EPS

Gun Hardening

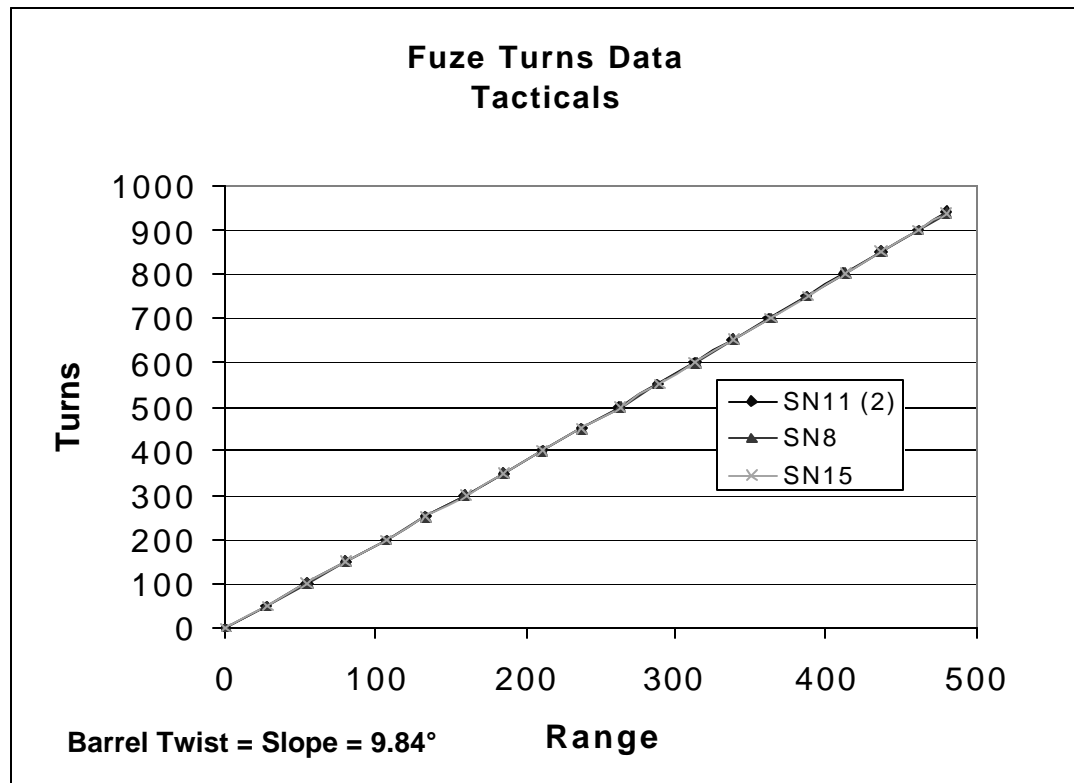


Gun Hardened Electronics Assembly

- Electronics survives setback and softcatch impact for multiple firings



- Turns data is repeatable from round to round

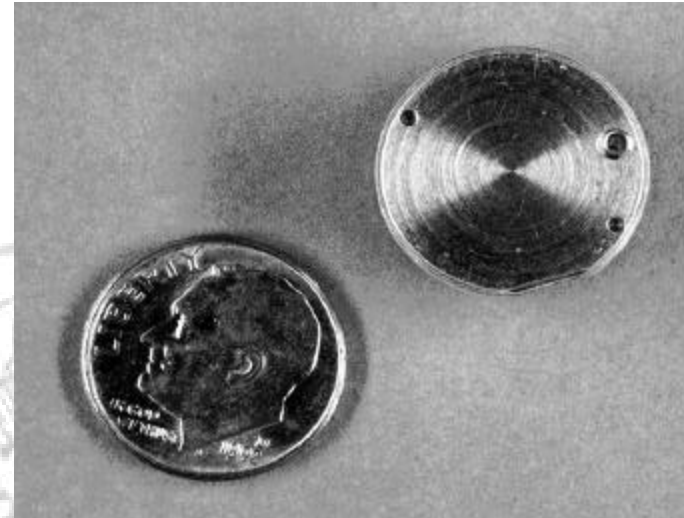


Test Data Analysis

- Time compensation method—simple RC oscillator < 1% error
- Accuracy and repeatability of turns counting in the supersonic region over a +200 m/s variation in muzzle velocity
- Time compensated/turns hybrid algorithm shown to be viable
- Turns range error mean + 3 sigma equals 2 meters at 500 meters

Safe and Arm

- Common applications to smoothbore and rifled munitions
- Command arm (outside safe separation) for MOUT
- Less than .1 cubic inch of volume
- Blocks simultaneous primer and detonator functions



Commonality



Cost Effective

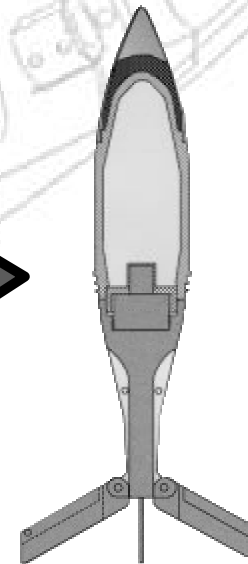
- Bursting munition technology for a family of medium and large caliber cartridges
- Cost goal of approximately 2 X Point Detonate (PD) round
- Demonstrated survivability in medium caliber gun environment



25mm
30mm
40mm



Turns Count/Time Fuze



105mm
120mm